

Optical Communication Subsystem for the X2000 Series of Planetary Missions

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NASA has started a major new Advanced Deep Space System Development (a.k.a. X2000) Program at **JPL**. The objective of this program is to develop and space-qualify (in a total system environment) advanced, cutting-edge technologies for the next generation of deep-space exploration missions. The targeted mission sets include the Fire and Ice missions (Pluto Express, Europa Orbiter, and Solar Probe), the Chimpollion comet mission, and the robotic (and eventually human) missions to Mars. The program will develop, qualify and integrate these technologies into a set of defined deliverables that will be demonstrated in the JPL Flight System Testbed. The first major deliverable is scheduled for completion at the end of FY' 2000, with subsequent deliverables completed at approximately 2-year intervals thereafter. One of the key technologies selected for development under this program as part of the first deliverable is optical communications.

Although designed initially around the Europa Orbiter mission conditions, the optical communications subsystem will be capable of providing expanded data rates from a variety of planetary mission applications. Development of the system has commenced based on detailed studies conducted in FY'97. The laser communication terminal contains a 30-cm diameter telescope, redundant focal plane array detectors, redundant uplink data detectors, and a pair of diode-pumped solid-state laser transmitters. This terminal is also multi-functional. In addition to laser-communication, it is also capable of narrow-field/high-resolution science imaging, laser-altimeter returned-signal detection, optical imaging for final approach spacecraft navigation, and transmission and reception of navigational ranging signals.

This paper will describe the architecture, design, expected performance and development plan for the optical communications flight terminal, as well as the flight mission applications that such a terminal could support.